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Caliciopsis sambaibae sp. nov. from the Brazilian Cerrado

José Luiz Bezerra[1], Maruzanete Pereira Melo[2], José Evando Aguiar Beserra Jr[2*], Elliot Watanabe Kitajima[3], Samara Raquel Sousa[2], Cristiane Duarte Santos[1]

[1] *Centro de Ciências Agrárias, Ambientais e Biológicas, Universidade Federal do Recôncavo da Bahia, Cruz das Almas BA, 44380-000, Brazil*

[2] *Departamento de Fitotecnia, Universidade Federal do Piauí, Teresina PI, 64049-550, Brazil*

[3] *Departamento de Fitopatologia, Universidade de São Paulo, Escola Superior de Agricultura Luiz de Queiroz/USP, Piracicaba SP, 13418-900, Brazil*

[*] Correspondence to: *evando@ufpi.edu.br*

Abstract—A new species, *Caliciopsis sambaibae*, is described associated with *Davilla elliptica* plants. The collections were made in the Cerrado of Sete Cidades National Park, in the municipality of Piracuruca, Piauí State, Brazil.

Key words—*Ascomycota*, *Coryneliaceae*, *Coryneliales*, *Eurotiomycetes*, sambaíba

Introduction

The Cerrado, designated as a neotropical plant diversity hotspot (Simon & al. 2009), is the main vegetation type of five Brazilian states—Minas Gerais, Goiás, Mato Grosso do Sul, Maranhão, and Tocantins—and also occurs in six other states—Bahia, Mato Grosso, Piauí, São Paulo, Paraná, and Rondônia (Beuchle & al. 2015). This vegetation covers about 23% of Brazil and incorporates c. 12,000 species of angiosperms (Zappi & al. 2015). *Davilla* Vand., one of the most diverse genera within *Dilleniaceae* Salisb., comprises about 30 neotropical species of lianas and erect or climbing shrubs (Fraga & Stehmann 2010). Plants of this genus are locally known as "sambaíba" and are commonly used in traditional medicine in anti-inflammatory treatments (Lima & al. 2014).

The survey of fungi associated with plants from the Cerrado has revealed many new fungi (Dornelo-Silva & Dianese 2004, Dornelo-Silva & al. 2007)—c. 100 new species and 20 new genera of fungi (mainly ascomycetes) have been described (Dianese 2000, Hernández-Gutiérrez & Dianese 2008, Pereira-Carvalho & al. 2009, Armando & al. 2015, Firmino & al. 2016, Melo & al. 2017).

Caliciopsis (*Coryneliaceae*), represented by c. 30 species and found in temperate and tropical regions of North and South America, Eurasia, and Australia (Crous & al. 2016, Pratibha & al. 2010, Fitzpatrick 1920), is characterized by long black perithecia lacking paraphyses, evanescent asci, and brown ascospores. Some species produce an asexual morph, which is rarely observed because the conidia are produced within stromatic pycnidia (Garrido-Benavent & Pérez-Ortega 2015). Some species are associated with tree cankers or leaf spots (Jordal & al. 2004, Pratibha & al. 2010); severe cankering is caused by the type species *C. pinea* Peck (on *Pinus*), *C. calicioides* (Fr.) Fitzp. (on *Populus*), and *C. pleomorpha* P.A. McGee & Pascoe (on *Eucalyptus*) (Benny & al. 1985, Fitzpatrick 1920, 1942; Munck & al. 2015, Pascoe & al. 2018).

The symptoms on our collections of *Davilla elliptica* leaves began with yellow spots, which turned necrotic and brown. In the lesions, we noted numerous fungal structures similar to black spines corresponding to the rostrate perithecial necks characteristic of a *Caliciopsis* fungus. As the morphology and biometric data of our specimens do not correspond with any described *Caliciopsis*, we propose a new species, *Caliciopsis sambaibae*.

Materials & methods

During 2014–16, *Davilla elliptica* leaves bearing signs of fungal infection were collected in Sete Cidades National Park in the municipality of Piracuruca, Piauí State, Brazil. The leaves were examined under a stereoscopic microscope and fragments and hand sections of the ascomata were mounted between slide and coverslip using Amann's lactophenol. Leaf samples were submitted to scanning electron microscopy (SEM) in the Electron Microscopy laboratory of the Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, as follows: leaf fragments containing the fungal structures were placed on filter paper moistened in a Petri dish, along with a small plastic container containing ca. 1 mL of 2% OsO_4 in aqueous solution. The container was wrapped with Parafilm and foil and left overnight (Kitajima & Leite 1999). The plate was then opened, and the leaf fragment was removed, air dried, mounted in the scanning electron microscope stub port with carbon double-sided adhesive tape, and covered with a thin layer of gold on a Bal-tec SCD050 sputter coater. The sample was examined and digitally recorded with a LEO 435 VP scanning electron microscope at 20 kV and a 10-mm working distance.

Specimens were conserved in the herbarium, Universidade Federal de Viçosa, Minas Gerais, Brazil (VIC).

Taxonomy

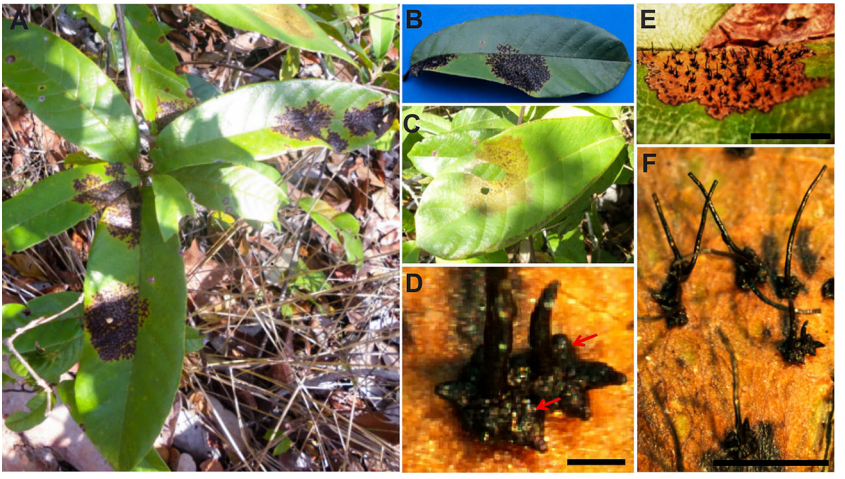

Plate 1. *Caliciopsis sambaibae* (holotype, VIC 44133) on *Davilla elliptica*. A–C. leaf symptoms; D–F: perithecia on leaves (LM). Scale bars: D = 30 µm, E, F = 100 µm.

Caliciopsis sambaibae J.L. Bezerra, M.P. Melo & Beserra, **sp. nov.** Figs 1, 2

MB 819221

Differs from other *Caliciopsis* spp. by its perithecia having scars on their middle third and a basal dilation where ascospores are stored, and by its dilleniaceous host.

Type: Brazil, Piauí, Piracuruca 4°02′08″S 41°40′45″W, on living leaves of *Davilla elliptica* A.St.-Hil. (*Dilleniaceae*), 20 May 2016, M.P. Melo (**Holotype**, VIC 44133).

Etymology: Referring to "sambaíba", the common name of the host.

Spots yellowish, becoming brown and necrotic with age. Colonies amphigenous, rarely epiphyllous. Stromata irregular to circular in outline, superficial mycelium absent; internal mycelium intercellular; stromata black, formed on the leaf surface from which the perithecia and pycnidia are inserted. Sexual morph: perithecia ellipsoid, with long necks, simple or forked, straight or curved, 550–730 × 30–60 µm, with a swollen ascogenous region near the base; ring-like scars and apical filaments on the necks of mature perithecia; asci bitunicate with eight ascospores, formed in the ascogenous swellings, evanescent, 17–20 × 5–7 µm (n = 20); ascospores 1-celled, smooth-walled,

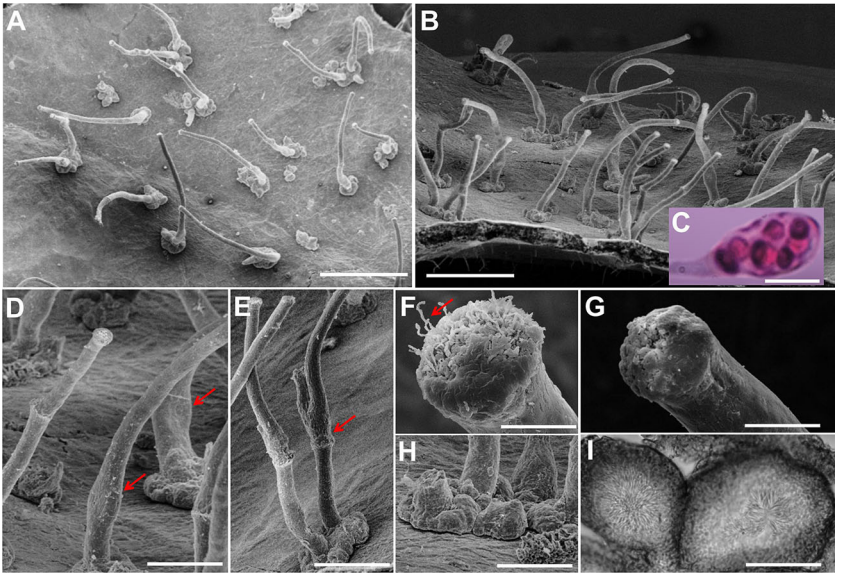

Plate 2. *Caliciopsis sambaibae* (holotype, VIC 44133) on *Davilla elliptica*. A, B. perithecia (SEM); C. asci and ascospores (LM). D, E. scars (red arrows) on face of perithecia (SEM); F. apical filaments (red arrow) on the neck of mature perithecium (SEM); G. neck of immature perithecium (SEM); H. pycnidia in the basal stroma (SEM); I. cross sections of pycnidia (SEM). Scale bars: A, B = 1 mm; C = 10 µm; D, E = 200 µm; F, G = 20 µm; H = 200 µm; I = 10 µm.

globose to lenticular, brown, 3–6 × 3–5 µm. pycnidia cespitose, developed at the perithecial base, irregular, stromatic, 23–20 µm diam.; conidiogenous cells holoblastic, nearly inconspicuous; conidia 1–celled, smooth, hyaline, ellipsoid, 3–4 × 2 µm.

Additional specimen examined: **BRAZIL**, **Piauí**, **Piracuruca**, on living leaves of *Davilla elliptica*, 11 October 2014, J.E.A. Beserra Jr. (VIC 44132).

Discussion

Caliciopsis sambaibae produces ellipsoid, spine-shaped perithecia with ascogenous swellings near the bases where the asci are formed. Sections in this region revealed asci in formation, and ascogenous swellings were not observed in immature perithecia. The apex of the perithecial ostiole is somewhat dilated, and hyphal filaments may assist in the transfer of ascospores to this region. Due to their evanescent nature, only a few intact asci could be observed. Possibly for this reason, asci have been observed only in *C. indica* J. Pratibha & Bhat, *C. valentina* Garrido-Ben. & Pérez-Ort.,

C. calicioides, and *C. beckhausii* (Körb.) Garrido-Ben. & Pérez-Ort. (Garrido-Benavent & Pérez-Ortega 2015, Jordal & al. 2014, Pratibha & al. 2010). After disintegration of the asci, passive ascospore liberation and agglomeration occur at the extremities of the perithecial necks. The presence of pycnidia immersed in plant tissue separates *C. arrhiza* (Pat. & Gaillard) Bat. & J.L. Bezerra and *C. confusa* Bat. (Batista & Maia 1964, Batista 1956) from *C. sambaibae*. The presence of scars in the middle or near the apex of the ostiole, as well as bifurcated ostioles distinguish *C. sambaibae* from other *Caliciopsis* species. The pycnidia of *C. sambaibae* are generally produced in groups inserted in the basal stroma, a morphological feature shared with *C. beckhausii*. Although most *Caliciopsis* species are associated with tree cankers (Jordal & al. 2004, Benny & al. 1985, Fitzpatrick 1942), we did not observe cankers in *Davilla elliptica* plants. *Caliciopsis indica* is the only species associated with leaves (Pratibha & al. 2010).

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